

MgO-Based Tunnel Spin Injectors

Abstract

A MgO tunnel barrier is sandwiched between semiconductor material on one side
5 and a ferri- and/or ferromagnetic material on the other side to form a spintronic element.
The semiconductor material may include GaAs, for example. The spintronic element
may be used as a spin injection device by injecting charge carriers from the magnetic
material into the MgO tunnel barrier and then into the semiconductor. Similarly, the
spintronic element may be used as a detector or analyzer of spin polarized charge carriers
10 by flowing charge carriers from the surface of the semiconducting layer through the MgO
tunnel barrier and into the (ferri- or ferro-) magnetic material, which then acts as a
detector. The MgO tunnel barrier is preferably formed by forming a Mg layer on an
underlayer (e.g., a ferromagnetic layer), and then directing additional Mg, in the presence
of oxygen, towards the underlayer.

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